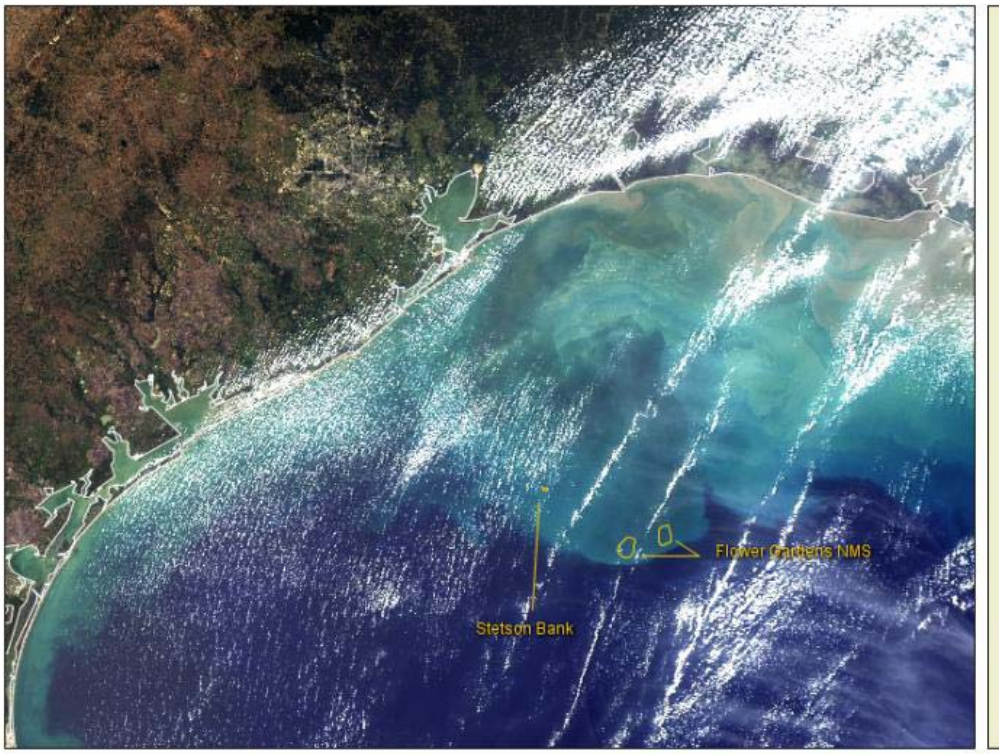
Office of National Marine Sanctuaries/National Centers for Coastal Ocean Science Long-term Agreement (ONMS/NCCOS LTA)

2005 Annual Liaison Report on Existing and Potential ONMS/NCCOS Collaborative Studies at the Flower Garden Banks National Marine Sanctuary (FGBNMS)



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2005 FISCAL YEAR (FY05) PROJECT UPDATE

There were no projects funded for the Flower Garden Banks National Marine Sanctuary (FGBNMS) under the FY05 Office of National Marine Sanctuaries (ONMS)/National Centers for Coastal Ocean Science (NCCOS) Long-term Agreement (LTA). However, a response was mounted in the aftermath of Hurricanes Katrina and Rita to assess possible impacts to the FGBNMS. These efforts involved coordination between the FGBNMS, the Coral Disease and Health Consortium through NCCOS CCEHBR and the University of Hawaii. Below is an account of the response plan and preliminary findings.

RESPONSE FOR HURRICANE IMPACT ASSESSMENT AT FLOWER GARDEN BANKS NMS

Sampling Plan for Collection of Samples for Contaminant and Biomarker Analyses at Stetson and the East and West Banks of the FGBNMS

Mission Coordinator: Emma Hickerson Initial Call for NOS' National Centers for Coastal Ocean Sciences (NCCOS) Assistance Satellite Report Date: September 26, 2005 Event Response Date: October 10, 2005

Background Information:

FGBNMS sustained two hurricane hits. Hurricane Katrina reached category 5 strength on August 28, 2005 about 250 miles south-south east of the Mississippi River mouth. During the day it turned NW and then N making landfall on August 29, 2005, in Plaquemines Parish, Louisiana just south of Buras with 140MPH winds (category 4). A second landfall was made near the LA/MS border as a category 3 and continued 100 miles inland with hurricane force winds. Extensive flooding and from this area of the Gulf coast created plumes of freshwater and associated components from the land to wash into the Gulf.

On September 7, 2005, Emma Hickerson of the FGBNMS contacted the National Ocean Services' (NOS) National Centers for Coastal Ocean Science (NCCOS) Liaison, Cheryl Woodley to request assistance from NCCOS. The request specifically asked for emergency response assistance from NCCOS to: (1) gain access to real-time satellite data to determine path of plume from the Mississippi River (this information will guide when to schedule site visits to collect water (and other) samples at the Flower Garden Banks); (2) water analysis to assess possible impacts from toxins, sewage, decomposition, etc. (FGBNMS is looking for direction from NCCOS as to other possible analyses that may be necessary); conduct post-exposure analysis of biota from the FGBNMS (e.g. coral).

Rick Stumpf of NCCOS' Center for Coastal Monitoring and Assessment (CCMA) and other CCMA representatives were contacted by NCCOS Liaison (Woodley) to determine possible assistance for both satellite imagery and contaminant analyses. Rick Stumpf responded immediately with satellite imagery of the area and followed up with regular updates as images were available. Contaminant chemistry activities were already obligated to coastal activities by CCMA and unavailable for assistance as was NCCOS Center for Coastal Environmental Health and Biomolecular Research (CCEHBR) Ecotoxicology. Satellite imagery at this time indicated no immediate threat to the FGBNMS from water masses.

On September 21, 2005, Hurricane Rita intensified to a category 5 and strengthened on September 22, 2005 approx. 570 miles E SE of Galveston TX. Although subsequently weakening as it

passed through the Gulf it produced storm surge flooding in portions of the New Orleans area and as Rita turned NW and weakened to category 3 on September 24, it made landfall just east of the TX/LA border between Sabine Pass and Johnson's Bayou. Rita caused devastating storm surge flooding and wind damage.

As satellite images continued to be monitored, a large plume of water from the coastal area was detected on September 26, 2005 over the FGBNMS. Images subsequently on September 28 saw some dissipation of the plume and further dissipation over time.

Discussions resumed between FGBNMS and the NCCOS Liaison, as to possible actions to take if weather permitted a sampling mission. Collaborative relationships with toxicologists, Drs. Gary Ostrander and Bob Richmond of the University of Hawaii (UH), Manoa and their collaborator, Craig Downs (Haereticus Environmental Laboratory) allowed discussions as to possible actions. Collectively, it was determined for the short-term to conduct an ecological impact assessment of the FGBNMS followed by a long-term ecological risk assessment of the sanctuary regarding the effects of coastal activities on the FGBNMS.

The impact assessment would involve the sanctuary collecting coral tissue for biomarker analysis, possibly water (if deemed appropriate at the time when sampling could occur), possibly tissue for contaminant analysis and sediment samples for contaminant analysis (metals, PAHs, pesticides etc). These analyses would be conducted by UH, at no charge.

For the subsequent longer term ecological risk assessment (ERA), the UH would take the lead by drafting a white paper outlining their proposed plan for conducting the ERA and seeking funding to support the activity. Other investigators at UH in microbiology and oceanography were subsequently consulted for input and possible participation in an ERA.

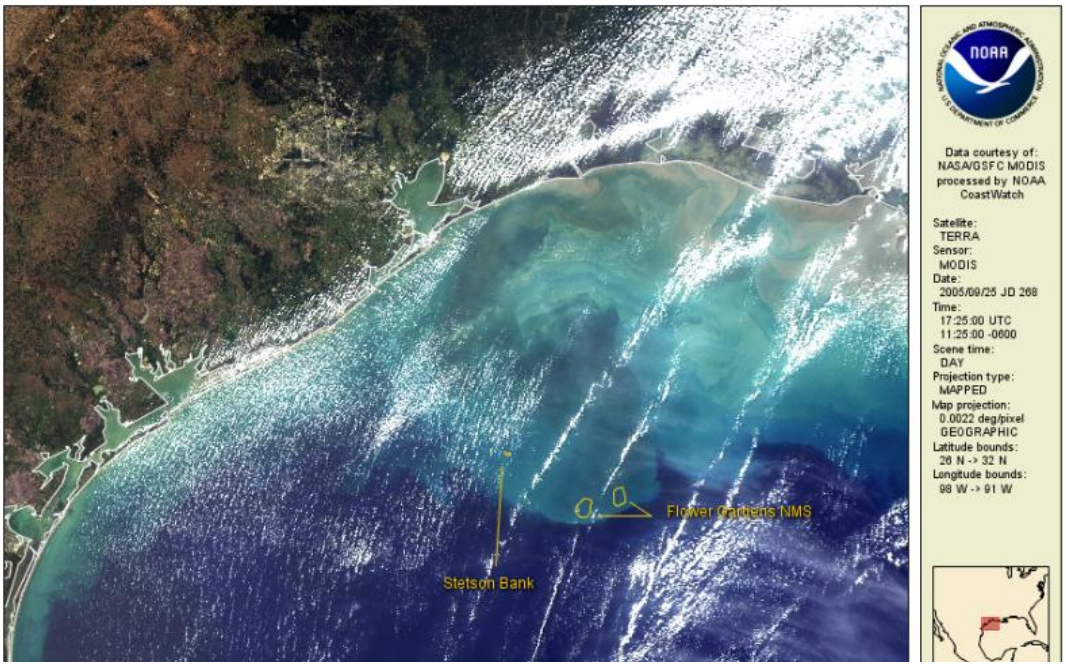
FGBNMS Research Coordinator, Emma Hickerson, in consultation with G.P. Schmahl (FGBNMS Manager) accepted the proposed assistance and agreed to work with UH who would lead an ERA for the FGBNMS to look at the interaction between coastal activities and the sanctuary. UH would be responsible for the overall design and obtaining funding for the long-term project, but would like a joint effort with direct participation by various government agencies (i.e., NOAA sub-organizations, EPA sub-organizations, Mineral Management Service), various NGOs, academia and interested stake-holders (e.g., energy industry). They would also depend on the sanctuary for logistical support and sample collections.

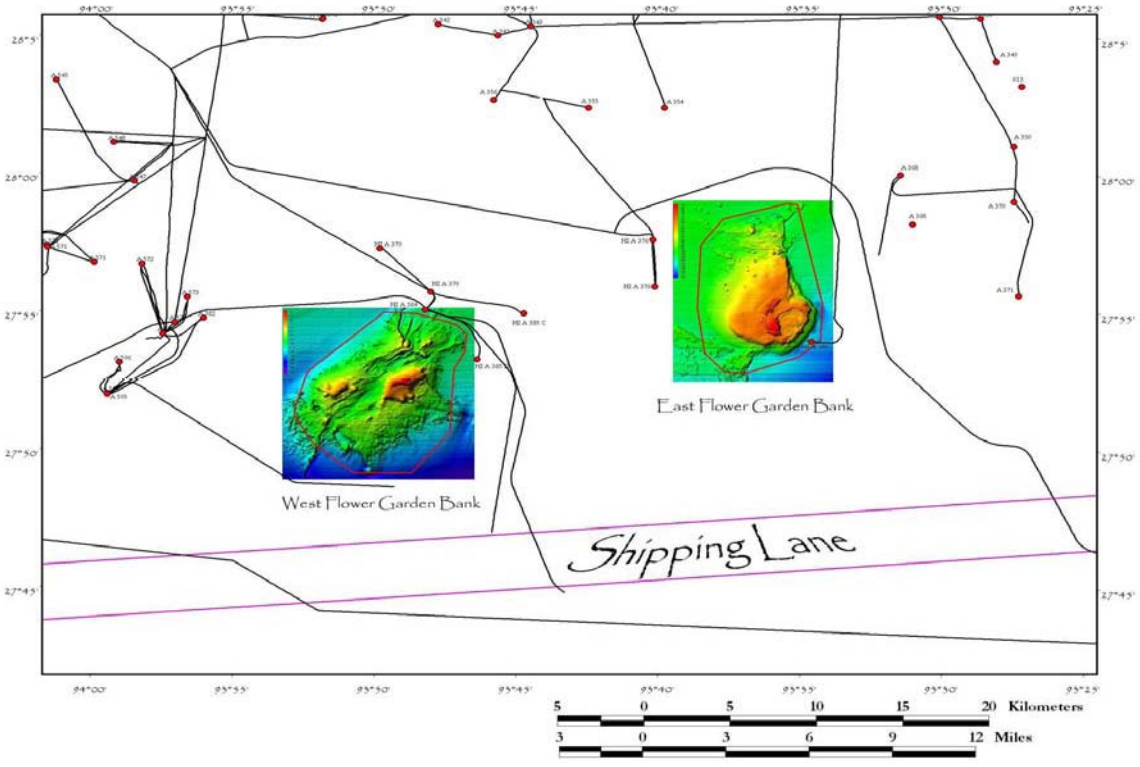
On September 30, 2005, Emma Hickerson was able to conduct an overflight of the sanctuary and determined the gas platform within the sanctuary boundaries (HI A 389) was intact and had sustained little damage, which was later substantiated by industry reports.

On October 4, 2005, FGBMNS notified NCCOS Liaison, Woodley, of a planned mission to depart early on the morning of October 10, 2005 for sampling to Stetson Bank and the East and West Banks of the FGBNMS. She asked for assistance in prioritizing sampling, detailed protocols for each type of sampling proposed and sampling supplies. NCCOS CCEHBR and the Coral Disease and Health Consortium's Rapid Response program, responded by providing sampling supplies, dry shipper and protocols.

A cruise was conducted by FGBNMS researchers to assess the condition and obtain samples from the East, West and Stetson Banks the week of October 10, 2005.

Locations: East, West and Stetson Banks of FGBNMS (see attached maps)





Tasks:

Objective 1: Collect water samples from surface and at coral depth
Objective 2: Collect tissue biopsies from *Porities astreoide*s for biomarker analyses
Objective 3: Collect sediment from each site for contaminant analysis (OC, OP, PAH, select metals)
Objective 4: Collect coral tissue samples for contaminant analysis
Objective 5: Deploy sediment traps
Objective 6: Collection and archiving of water and sediment for microbiology.

Protocols: Detailed standard protocols for this response were adapted from World Wildlife Fund (WWF) manual: *"Contaminant Chemistry Analysis Protocols for Organochlorine Pesticides and Polychlorinated Biphenyls for the World Wildlife Fund Meso-American Coral Reef Initiative: Biological and Sediment Samples"*

Diagnostic Laboratories Receiving Samples

-High through-put Biomarker Analysis and Contaminant Chemistry analysis for water, sediment & tissue

-Selected Biomarkers, based on case information

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RESULTS TO DATE

Visual Assessment

Observations by FGBNMS' Emma Hickerson and G.P. Schmahl, during the October 2005 dive mission to survey the reefs since both Hurricanes Katrina and Rita, and based on limited surveys, revealed significant mechanical impacts at all three sites within the sanctuary, including large boulders of reef rock and coral (up to 4m x2m in size) removed and tossed around the reef and into the sand flats, and at up to 1m of sand removed from the sand flats. Large barrel sponges (*Xestospongia muta*) had suffered considerable damage, including partial and full removal, or filling up with sand. To add insult to injury, the coral are undergoing a bleaching event - initial observations indicate between 35% and 40% of the colonies are bleached partially or fully. The bleaching appears to be affecting 100% of the fire coral (*Millepora alcicornis*) and great star coral (*Montastraea cavernosa*), and affecting at least eleven other species to varying degrees. Temperatures on the reef last week were 29.0 - 29.2 degrees C throughout the water column. This appears to be 2-3 degrees C higher than historical means. A follow-up cruise is underway this week on board the sanctuary vessel, R/V *PT. GLASS*, to conduct additional bleaching surveys and document hurricane damage within the sanctuary.

Chemical and Biological Assessments
Coral tissue, sediment, and water samples were collected for contaminant analysis through collaboration between the FGBNMS, NCCOS, and the UH. These collections were made in response to a large body of polluted water that made its way out from the TX/LA coast to the FGBNMS after Hurricane Rita (see http://coastwatch.noaa.gov/tsm/search.html). Due to the effects of the hurricanes, sediments had been scoured from around the reef leaving only gravel type substrate. Initial results for contaminants have been negative. Water samples have been subjected to solid-phase extraction and GC-MS analyses are pending. Biomarker analyses are also pending at this time.

Future Plans
For the subsequent longer term ecological risk assessment (ERA), the UH plans to take the lead by drafting a white paper outlining their proposed plan for conducting the ERA and seeking funding to support the activity. Other investigators at UH in microbiology and oceanography were subsequently consulted for input and possible participation in an ERA. The UH is interested in the FGBNMS impact from an extreme event is that they have a goal of setting up an Environmental Sciences program and this event would serve as a demonstration project for their efforts.

Emma Hickerson in consultation with G.P. Schmahl accepted the proposed assistance and agreed to work with the University of Hawaii who would lead an ERA for the FGBNMS to look at the interaction between coastal activities and the Sanctuary. UH would be responsible for the overall design and obtaining funding for the long-term project, but would like a joint effort with direct participation by various government agencies (i.e., NOAA sub-organizations, EPA sub-organizations, Mineral Management Service), various NGOs, academia and interested stake-holders (e.g., energy industry). They would also depend on the sanctuary for logistical support and sample collections.

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